MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/20

PAM0135 – ALGEBRA
(Foundation in Information Technology / Life Sciences)

12 October 2019
2.30 P.M - 4.30 P.M
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps **MUST** be shown.

Instruction: Answer **ALL** questions.

Question 1 [10 marks]

a.   Simplify the equation: $\left(\dfrac{-2^3 x^4 (yz)^2}{3^2 xy^3 z} \right)\left(\dfrac{x^2 y^3}{xy^4} \right)^{-2}$ (3 marks)

b.   Simplify:

$$\sqrt[3]{27x^3 y}(2a) + \sqrt[3]{8x^3 y}(3b) - \sqrt[3]{-x^3 y}(6c)$$ (3 marks)

c.   Solve the following inequality:

$$\frac{x+4}{2x-1} \geq 5$$ (4 marks)

Question 2 [10 marks]

a.   Determine the domain of the composite functions, $f \circ g(x)$

$$f(x) = \frac{x}{x-1} \; ; \;\; g(x) = -\frac{4}{x}$$ (3 marks)

b.   Solve the following equations:
      i. $3^{2x} + 3^{x+1} - 4 = 0$ (4 marks)

      ii. $\log_2(x-6) - \log_2(x) = 1 - \log_2(x-5)$ (3 marks)

Question 3 [10 marks]

    Given the quadratic function $f(x) = -4x^2 - 6x + 2$.

a.   Find the vertex, the x-intercepts, the y-intercept, and the axis of symmetry of the graph of f.   (5 marks)

b.   Sketch the graph of $y = f(x)$. Show clearly the vertex, the x-intercepts, the y-intercept, and the axis of symmetry on the graph.   (3 marks)

c.   Use transformation of the graph of $f(x) = \ln x$ to graph the function $f(x) = -\ln(x-2)$. Show clearly the graph's x-intercepts. What is the vertical asymptote?   (2 marks)

Continued...

Question 4 [10 marks]

a. Use the Principle of Mathematical Induction to show that:
$1 + 5 + 9 + ... + (4n - 3) = n(2n - 1)$. (5 marks)

b. In the expansion of $(x - 2y)^8$, determine the

   i. coefficient of x^5. (2 marks)

   ii. first three terms of the expansion. (3 marks)

Question 5 [10 marks]

a. Determine whether the infinite geometric series converges or diverges. If it converges, find its sum.

$$2 - \frac{1}{2} + \frac{1}{8} - \frac{1}{32} + ...$$ (3 marks)

b. The fifth term and the fifteen term of an arithmetic sequence are -54 and 36 respectively.

   i. Find the first term and the common difference of the sequence.

       (3 marks)

   ii. Determine the twentieth term of the sequence. (2 marks)

   iii. Determine the sum of the first 10 terms of the sequence. (2 marks)

End of Paper

APPENDIX

$a^2 - b^2 = (a-b)(a+b)$

$(a+b)^2 = a^2 + 2ab + b^2$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

$(a-b)^2 = a^2 - 2ab + b^2$

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$\log_b b = 1$

$\log_b 1 = 0$

$\log_b(MN) = \log_b M + \log_b N$

$\log_b\left(\dfrac{M}{N}\right) = \log_b M - \log_b N$

$\log_b M^p = p\log_b M$

$\log_b M = \dfrac{\log_a M}{\log_a b}$

$a_n = a_1 + (n-1)d$

$a_n = a_1 r^{n-1}$

$S_n = \dfrac{n}{2}(2a_1 + (n-1)d) = \dfrac{n}{2}(a_1 + a_n)$

$S_n = \dfrac{a_1(1-r^n)}{1-r}$

$S = \dfrac{a_1}{1-r}$, infinite sum $|r| < 1$